Question Paper Code: 93027

B.E./B.Tech. DEGREE EXAMINATION, DEC 2021

| | | Third | d Semester | | |
|------|--|---------------------------------|-----------------------------------|----------------------------------|------------|
| | | Computer Science | e and Business System | 1 | |
| | 1 | 9UMA327- Discrete | e Mathematics and Cal | lculus | |
| | | (Regu | lation 2019) | | |
| Dura | ation: Three hours | | | Maximum: | 100 Marks |
| | | Answer | All Questions | | |
| | | PART A - (| 10x 1 = 10 Marks | | |
| 1. | The symbolic form of "If it is raining, then I get wet" is | | | | CO6-U |
| | $(a) P \to \neg Q$ | $(b)P \rightarrow Q$ | $(c)\neg Q \to \neg P$ | (d) None | of these |
| 2. | Contra positive of P | | CO6-U | | |
| | $(a)\neg Q \rightarrow \neg P$ | $(b)\neg P \rightarrow \neg Q$ | $(c)Q \rightarrow P$ | (d) None | of these |
| 3. | How many ways can letters of the word "GOOGLE" be arranged | | | ed | CO2- App |
| | (a) 40 | (b) 150 | (c) 160 | (d) 180 | |
| 4. | If 'm' Pigeon occupi Pigeons | es 'n'(m>n) holes th | nen atleast one hole ha | s more than | CO6- U |
| | (a) $\left[\frac{n-1}{m}\right]$ | $(b)\left[\frac{m-1}{n}\right]$ | $(c)\left[\frac{m-1}{n}\right]+1$ | (d) $\left[\frac{n-1}{m}\right]$ | + 1 |
| 5. | The order of group | G= {1,-1,i ,-i } unde | er usual multiplication | | CO3- App |
| | (a) 4 | (b)0 | (c)1 | (d) 2 | |
| 6. | N,+) is a | | | | CO6- U |
| | (a) Sub group | (b) semi group | c) group | | (d) Moniod |
| 7. | Find $\lim_{x\to 1} \frac{x^2-1}{x-1}$ | | | | CO4- App |
| | (a)1 | (b) 2 | (c) 3 | (d) 4 | |

8. Find the $\frac{dy}{dx}$ for $\cos \sqrt{x}$ (a) $-\sin \sqrt{x}$ (b) $\frac{-\sin \sqrt{x}}{2\sqrt{x}}$ (c) $-\cos \sqrt{x}$ (d) $\frac{\cos \sqrt{x}}{2\sqrt{x}}$

9. $\iint dx dy \text{ gives} \underline{\hspace{1cm}}$

(a) Volume of R (b) Area of the region R (c) Length of R (d) None of these

10. $\int_{0}^{1} \int_{0}^{2} \int_{0}^{3} dx dy dz$ is equal to CO5- App

(a) 2 (b) 3 (c) 4 (d) 6 $PART - B (5 \times 2 = 10 Marks)$

11. Derive R from the premises $P \rightarrow Q$, $Q \rightarrow R$ and P CO1- App

12. Find the number of positive integers not exceeding 100 that are divisible by 5 CO2- App or by 11

13. In an abelian group prove that $(ab)^2 = a^2b^2$ CO3-App

14. Differentiate $e^{\sin x^2}$

15. Change the order of integration $\int_{0}^{a} \int_{y}^{a} f(x, y) dxdy$

 $PART - C (5 \times 16 = 80 Marks)$

16. (a) (i) Prove the following using CP Rule. CO1- App (8)

 $P \rightarrow \left(Q \rightarrow S\right), \, \neg R \vee P, \, Q \Rightarrow R \rightarrow S$

(ii) Using truth table find PCNF and PDNF for CO1- App (8) $(P \land Q) \lor (\neg P \land R) \lor (Q \land R)$

Or

(b) (i) Show that the premises "one student in this class knows how to CO1 - App write programs in JAVA" and "Every one who knows how to write programs in JAVA can get a high-paying jop" imply the conclusion "some one in this class can get high paying job"

(ii) Prove the following using Indirect method . CO1 -App (8) $P \to Q, Q \to R, \neg P \lor \neg R, P \lor R \Rightarrow R$

- 17. (a) (i) Find the number of positive integers between 1 and 600 CO2 -App divisible by 2, 3,5 or 7
 - (ii) Using Mathematical Induction show that, $n^3 + 2n$ is divisible CO2 -App (8) by 3

Or

- (b) (i) There are seven men and six women in a room. Find the co2 -App (8) number of ways four persons can be drawn from the room if
 - (a) they can be male or female,
 - (b) two must be men and two women,
 - (c) they all are of the same Gender.
 - (ii) Using generating functions Solve $a_n = 2a_{n-1} + 2^n$, $a_0 = 2$ CO2 -App (8)
- 18. (a) (i) Let G be a finite group of order 'n' and H be any subgroup of G CO3- App

 Then the order of H divides the order of G. (i.e) O(H) / O(G)

 (8)
 - (ii) The intersection of two subgroup of a group is also a subgroup CO3- App (8) of the group

Or

- (b) (i) Prove that in a group G is abelianiff $(a*b)^n = a^n*b^n$ CO3- App (8)
 - (ii) Prove that the union of two subgroup of G needs not a sub CO3- App (8) group
- 19. (a) (i) If $y = e^{ax} \cos bx$ Prove that $\frac{d^2y}{dx^2} 2a \frac{dy}{dx} + (a^2 + b^2)y = 0$ (8)
 - (ii) Determine the reduction formula for $\int \sin^{-n} x dx$ CO4-App (8)

Or

(b) (i) Compute
$$\int_{0}^{\frac{\pi}{2}} \frac{(\sin x)^{\frac{3}{2}}}{(\cos x)^{\frac{3}{2}} + (\sin x)^{\frac{3}{2}}} dx$$
 (8)

(ii) If
$$y = (2 \cos t - \cos 2t)$$
, $x = (2 \sin t - \sin 2t)$ Find the value of $\frac{d^2 y}{dx^2}$ CO4 -App at $t = \left(\frac{\Pi}{2}\right)$

- 20. (a) (i) Using the Triple integration, compute the volume of the tetrahedron $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$, x=0, y=0 &Z=0
 - (ii) Change the order of integration and hence evaluate $\int_{0}^{a} \int_{x}^{a} (x^{2} + y^{2}) dy dx$ (8)

Or

- (b) (i) Change the order of integration and hence evaluate $\int_{0}^{1} \int_{y}^{2-y} xydxdy$. CO5- App (8)
 - (ii) Evaluate $\int \int \int \frac{dxdydz}{\sqrt{a^2 x^2 y^2 z^2}}$ over the fitst octant of the sphere $\mathbf{x}^2 + \mathbf{y}^2 + \mathbf{z}^2 = \mathbf{a}^2$